An Ascertained,Smart System for Toll Plaza and Parking Management

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ABSTRACT

The objective of this work is to design, examine and implement"An Ascertained, Smart Systemfor TollPlaza and Parking Management" using RFID technology.This project work avoids censure and provides discernibility for passengers who travel on the highway as well as the time they wait in the waiting queue and then pay the toll tax as per the norms.This also deals with automated as well as smart toll gate management,automated parking system.All this proposed system will be carried out with the help of a single tag called an RFID tag,which they solve the problem of vehicle traffic,manual handling of records and paying money.The main agenda of this paper is that to implement a 3-minute rule on toll plaza.This will replace the human involvement and therefore will automatically calculate the amount of time, the commuters wait in the queue**.** Next, a notification will be sent to the commuter phone via WiFi Module**.** Not only RFID is applicable to the toll gate but also used in parking areas. And that specified area can be pre-booked using a web or an application in advance with only criteria of free space in the parking area in different locations.
Keywords—RFID;Smart Parking;3 Minute Rule in Toll Gate; Wifi Module

I. INTRODUCTION

With a tremendous development in roadways, there is a gradual increase in development in toll gates their and technology. These toll gates have long queues and time required to pay the tax and return back the exact change causes more delay. Internet of Things [IoT] is basically the "network of network of things" through which the components, there is a communication of data with the help of sensors, connectivity. There is no human intervention in this system. IoT has applications in fields such as healthcare, energy, transportation, communication etc. As days are passing, the number of vehicles on the road are increasing rapidly along with cons such as accidents,pollution.There are many challenges we are facing such as to reduce the travel time, increase efficiency, safety. According to the survey carried out in 2010 in Maharashtra, the annual toll tax collected was 1200Crores and the estimated cost was 1500Crores. Therefore there was a prediction that it was a loss of 300Crores due to human intervention. Automatic toll collection keeps track of any vehicle that is not registered and removes unnecessary traffic delay. The aim of this project is that it will automatically detect the approached vehicle and keep track of the vehicle.

As per the reply received to an RTI filing by an advocate Mr. Jindal from NHAI, drivers who pass the toll gate can pass free of cost, should spend over 2 minutes 50 seconds in the waiting queue. Thereply to the RTI from NHAI tells that,"there is a total waiting time of 3 minutes. If the 3 minutes exceeds in waiting,then there is a provision to pass the vehicle free of cost." The reply further says that "2 minutes 50 minutes are required for a vehicle to wait for its turn in the queue.

Firstly, a blanket rule cannot be implemented across the nation regarding this because of the variation in road sizes. So, If it is a 6-lane highway, it can be expanded at the toll booth to accommodate 10 or maybe 12 booths, but if it is a 2-lane highway, it would barely be able to accommodate 4-lanes at the toll booth. Adding to this is, the time factor. The Vehicle in front has to move, then this vehicle has to be shifted into gear, and moved ahead. Most of the time, the vehicle's drivers do not have the exact amount to tender and end up giving a Rs500 or even Rs2000 currency note. The toll operator would then have to compute the transaction and return the remaining amount.

Now add to this, the kind of toll operator present in the booth, and how fast/slow he/she operates, and then you start getting the idea that, it is generally not possible to finish the whole transaction in a few seconds (like the rules would want it to happen). The fast-track lane was introduced to counter this exact problem. But, once again, lack of awareness leads most people to get into the fast-track lane without having the fast tag. The toll operators decided to counter the issue by positioning an employee there too, collecting toll manually, and we are back to square one.

Though the idea of waiting at a toll for not more than 3 minutes is very lucrative and enticing, it does not seem like it can be implemented successfully. Well, not in all parts of India at least. Even if one expects to be let through the toll gates free of cost after waiting for more than 3 minutes, how would it be explained to the toll operators that it has been three minutes? Would anybody want to waste some more time in arguing with the toll operators or just pay and leave? This is one of the many reasons why this rule has stayed low.

Therefore, we have just tried to give a solution to the problem that is been faced.

II. METHODOLOGY AND MATERIALS USED

An Ascertained, smart toll plaza and parking management consist of components which are centralized to Raspberry PI3 which is in turn connected to WiFi Module, Mobile, Monitor, IR Sensors, RFID Technology.IR Sensors and WiFi Module are connected to mobile via wireless communication. The block diagram is as shown in the figure.
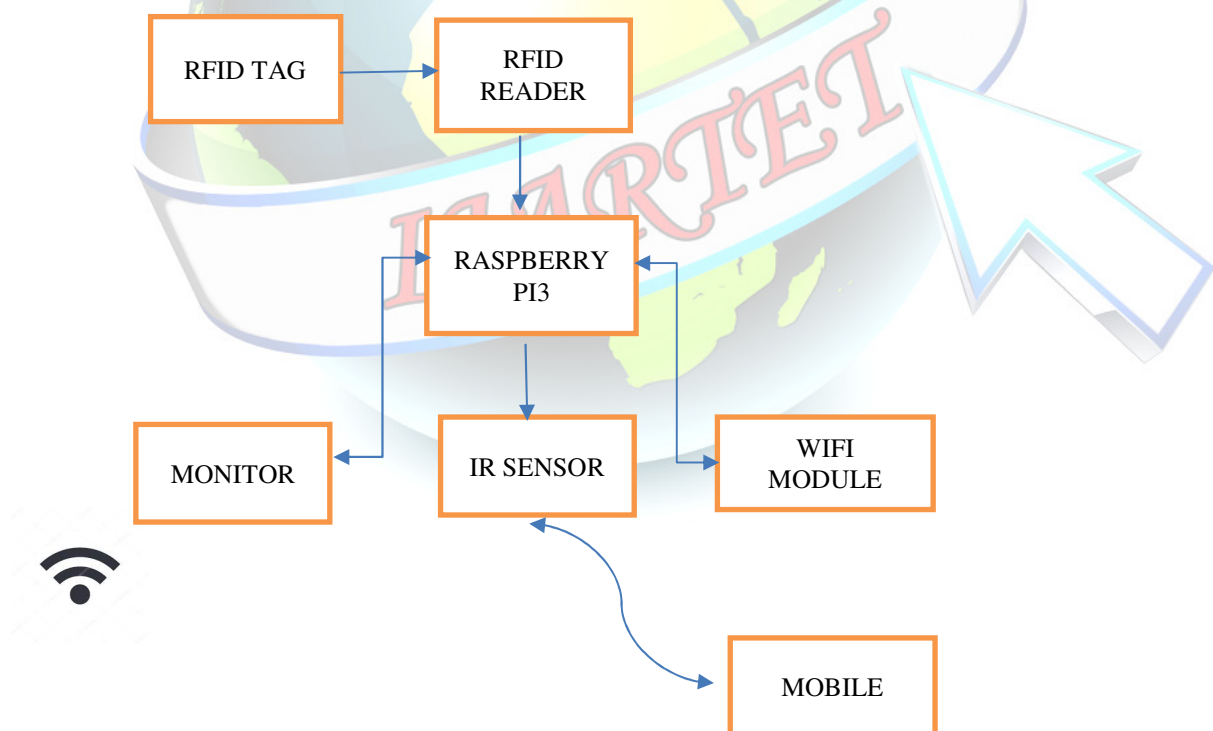

Figure 1: Block diagram of the connection of materials.

The RFID connected to the Raspberry Pi3 Model B will capture the details of tag when there is an interruption of the rays in the IR sensor. An IR sensor is an electronicdevice, that emits in order to sense some aspects of the surroundings. An IR sensor can measure the heat of an object as well as detects the motion. These

types of sensors measure only IR radiation, rather than emitting it that is called as a passive IR sensor.Usually, in the IR spectrum, all the objects radiate some form ofthermal radiations. These types of radiations are invisible to our eyes, that can be detected by an infrared sensor.when the vehicle comes near the sensor the IR rays that are passing through the transmitter and the receiver breaks and the information will be captured.
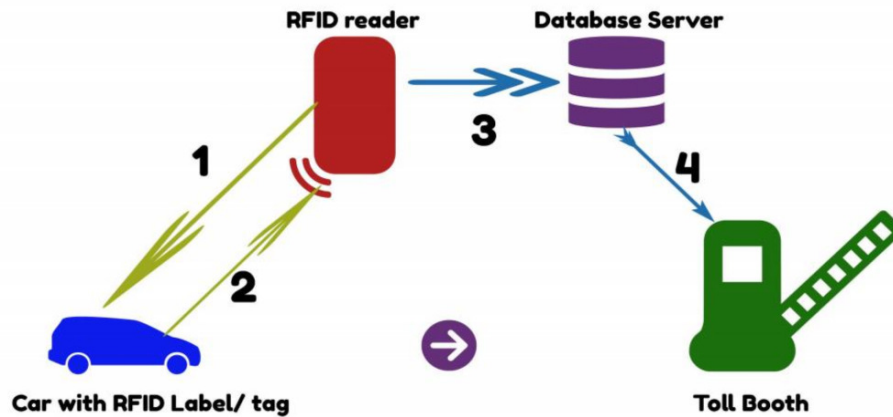

**Figure 2: Block diagram of the basic operation of tollgate.**

RFID Readers, RFID Windshield Tags with Memory & UID, A Computer system to interpret data in a visual format,A network connection feeding data from reader-database-computer, Database,Vehicle to be tagged are materials or components required in this project along with electrical components.The working of this project is as shown below:

1. The first step is to attach an RFID Tag on to a windshield vehicle. The tag contains a unique ID or more information associated with the vehicle.
 2. An RFID reader is placed between the Tollgate/ Parking gate.
3. The RFID reader (In the diagram, represented by '1') constantly scans the area or at a certain required interval. It depends on the programming of the reader. Once the tag is in the vicinity of the reader, the tag reflects signals emitted from the reader. Using the reflected pattern/signal reader decodes the UID/ Details imprinted on the tag ('2').
 4. The collected data is then sent to an online/local database ('3'), where the data is stored and compared with existing data of the vehicle. After the verification is done, if the vehicle has genuine access the signal is sent to the toll booth/ parking blockade to allow access to the vehicle('4"). If not verified, a message is displayed on the computer screen at toll booth.
5. Automation of payment/ parking spots/ fine etc. can be facilitated using this technique. Which is proven to be much faster and secure than most pay and park system, especially the ones involving a phone call and inputting credit card numbers.

A.Software Requirements

Python is a simple programming tool available for Raspberry Pi. Python is a widely used high-level programming language for general purpose programming. An interpreted language,Python has a design philosophy which emphasizes codereadability anda syntax which allows programmers to express concepts in fewer lines of codes compared to other languages. The database is defined as the collection of the interrelated data that is maintained and managed by the software here by the MYSQL server, which is used to maintain the details of the registered vehicles in the database and if the details are valid the further process is done such as deducting the amount from his account and the details are updated in the database.

B. FLOW DIAGRAM
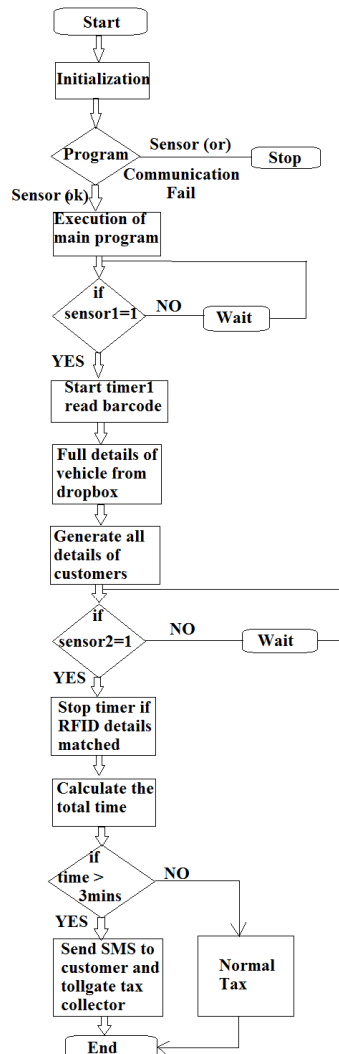
Starting with our data flow diagram, we will Initialize the program. The simple program is written in which, it checks for the communication and sensor, which is actually a post program and it consists of subroutines. We have two different cases where it may be either Yes (or) No, if no it stops.If the above post program is successfully executed, then the main program is executed, which checks for sensor1 condition (placed in parking slots).If a sensor1 condition is false then it waits to get sensed (waits for a vehicle), else if it is true (if the vehicle arrives),sersor1 starts with timer1.Once the timer is started, the details of the vehicles is searched, fetched in the drop box and is displayed on administrator screen.The Second condition is to check with sensor2 (placed in toll plaza), if false it is kept in the hold to get sensed, else it stops the timer once the RFID details are matched with tag and the total time is calculated. If the total time is greater than 3mins it sends the notification SMS to the customer in toll plaza and to the tollgate tax collector about the amount reduction. Else if total waiting time is lesser then 3mins normal tax will be charged. Finally, if all the above conditions are true, the project is executed successfully.

The process starts as the vehicle approaches the first pair of RFID reader and the IR sensor that is attached to a post T1 present 10 m away from the post T2 at the toll plaza.The vehicle is sensed and the reader reads the RFID tag attached to the vehicle.the tag verifies the user and collects the information of the user from the database.The information includes the phone number,vehicle number,etc. a message is sent to the user using the details. when the user reaches the post T2, if the time recorded is more than 3 minutes the alert message is sent to the user. The timer stops and automatic deduction of money takes place accordingly.The parking system uses

the same concept of payment using the time variable and user can book the parking slot in advance choosing the area for parking.The vehicle booked is first verified upon reaching the parking area and the user is allowed to park the time for parking is recorded and the amount is deduced accordingly when the user leaves.

C.Advantages of using RFID Technology :

1. RFID works much faster than almost all other technology counterparts.
2. Multiple RFID Tags can be read much faster than Bar-codes.
3. RFID Tags are very durable, Some products could last up to 50 years, which is usually more than a lifetime of most vehicles.
4. Due to fast scanning and recording of data, Instant approval/ Pass can be accommodated in toll plaza.
5. The Government has made its mandate to use RFID Tags for tracking vehicles in some countries to reduce vehicle & identity theft.
6. Automated Toll payment/ Access approval can be provided and the process can be completed instantly. The whole process is too fast leading to no need of stopping at the toll gate or carrying cash, Saving time and less congestion.
7. Automated parking spots can be implemented by reading the RFID Tag of vehicles and comparing it with the number of vacant spots available in the lot. This step avoids confusions and parking related problems to an extent. Never again you'll have to make a call or wait in a queue to avail parking.
8. Customers can easily verify the genuine vehicles using company fitted RFID Tags. This is applicable for spare parts also.
9. Prevents counterfeits as RFID Tags are harder to reproduce. Most tags will contain a UID (Unique Identification)

III. CONCLUSION

In this paper, we have presented the topic called IOT aware smart toll gate and parking system which help to reduce congestion that arises from vehicles and thereby provide an environmental eco-friendly life. We can develop either an android or web application. Using this application the user can find any available space in a parking area, pay payments and receive notifications. Then another application into is RFID smart toll gate which will automatically the details of vehicles accurately. The result will be a reduction in manpower, traffic, and money. In future enhancement, we will be using WIFI technology instead of RFID and also rather than using Dropbox we will be using cloud infrastructure and update data from toll gate system. Also will be providing an anti-theft solution which prevents the passing of defaulter vehicle.

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